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China Report

SCIENCE AND TECHNOLOGY

No. 59

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CHINA REPORT

SCIENCE AND TECHNOLOGY

No. 39

CONTENTS

ABSTRACTS

'GUANGMING RIBAO' ON COUNTRY'S NUCLEAR SCIENCE PROGRAM

HK1606150 Beijing GUANGMING RIBAO in Chinese 29 Feb 80 p 2 HK

[Special feature by reporters Kuo Zhizhong [1379 5267 0022] and Lin Yuehe [2651 3760 2885]: "Let Nuclear Science Serve the Four Modernizations"--Observations of the First Congress of the Chinese Nuclear Society]

[Text] Flashes, booming sounds, shock waves and mushroom clouds.... At the mention of nuclear science, people think of earthshaking nuclear explosions.

In fact, this is only one aspect of the problem. With people's increasing awareness of atomic nuclei, nuclear science has been widely used to serve mankind. At present, making nuclear science serve the four modernizations is the firm conviction and solemn pledge of those in our nuclear and technical circles.

This is a profound impression that the first congress of the Chinese Nuclear Society has left on the reporters.

For 30 years, our party and state have attached great importance to the development of the atomic effort. As early as in the 1950's, Comrade Mao Zedong pointed out, "Now the new historical period for atomic research has begun." Comrade Zhou Enlai personally formulated the first 12-year plan for scientific development. Five priority projects specified therein were called by scientists the "five golden flowers." It was atomic science that ranked as the first golden flower.

However, this golden flower was buffeted by rain and wind in its growth. In the Great Cultural Revolution, sabotage came from Lin Biao and the "gang of four." Comrade Zhou Enlai did all in his power to protect the atomic effort and large numbers of atomic scientists. When Lin Biao and his ilk ordered the relevant atomic departments to move their factories, Comrade Zhou Enlai spoke up. He sternly criticized them and stopped them from doing so. He decided that the factories could not be moved. He also demanded that they be made to increase production instead. When the "gang of four" wildly persecuted scientific and technical personnel in a

vain attempt to disband large numbers of atomic scientists and technicians, it was again Comrade Zhou Enlai who ordered them to "stop right away," forbidding them to do as they wished. Comrade Li Jiao, vice minister of the second Ministry of Machine Building, said emotionally to the reporters: "Our atomic effort really owes much to venerable Premier Zhou!"

Now we have atomic and hydrogen bombs. We have successfully broken the nuclear monopoly! We have also made great progress in the peaceful use of atomic energy. After the smashing of the "gang of four" Comrade Hua Guofeng dedicated an inscription to the atomic effort: "Aim high and have lofty ambitions. Scale the new heights in atomic science and technology, and catch up with and surpass advanced world levels." Spring has smiled on atomic science!

Scientists participating in the congress of the nuclear society fervently hope that with spring brought to atomic science they can step up nursing this thriving young plant--the nuclear power station. Some time ago, Deputy Chief Engineer Zuo Hu of the Nuclear Power Bureau of the second Ministry of Machine Building wrote an article entitled "Our Country Should Develop Nuclear Power." Published in this newspaper, it aroused great interest from the readers. This time we met again. He started the conversation by saying, "In the past, people did not quite understand the internal secrets of atoms. They blanched at the mention of the 'nucleus'! The fact is that nuclear power is not so fearful."

Why is it that people in the past used to show no interest in nuclear power stations? There are generally two reasons. First, people did not know whether it was safe and reliable to operate such stations. They worried about explosions and radiation. Second, they did not know whether these stations were economical and functional. They worried about the cost. Comrade Zuo Hu said that it was safe and reliable to operate a nuclear power station. An explosion was basically impossible, because the fuel for an atomic bomb is fissionable material of great purity--uranium-235 or plutonium-239. As required by design, the fissionable material, after being detonated, should quickly coalesce into a configuration contributing to the fission reaction in the same moment. The fuel for a nuclear power station is usually natural uranium or uranium-235 which is dispersed in hermetically-sealed structural material. It is a low-density uranium of only about 0.3 percent. This will not lead to an explosion under any circumstances.

As to the problem of radiation from the nuclear power station, some data are given as follows:

The United States currently has over 70 nuclear power stations in operation. Over a period of 1 year every American is exposed to an average of only 0.1 millirems of radiation from nuclear power stations. This is less than the 1-2 millirems of radiation from 1 year's exposure to a luminous watch. It is also less than the 1-1.5 millirems of radiation from 1 year's exposure to color TV sets. The effect of radiation from nuclear power

stations on the human body is nothing to speak of when we consider the average annual amount of natural radiation to which it is exposed. Every American is annually exposed to 100 millirems of natural radiation. This is almost 1,000 times the radiation that comes from nuclear power stations! Any fear about radiation from nuclear power stations is just unfounded.

Natural uranium and uranium-235 are used by nuclear power stations for fuel. A very little amount of uranium can generate a lot of electricity. This has been proven theoretically and in practice. For instance, 1 gram of uranium-235 can produce 24 x 10 to the sixth power watt-hours of heat. With one-third of them converted into energy, 8,000 kilowatt-hours of electricity can be generated. One metric ton of uranium-235 is the equivalent of 10,000 metric tons of standard coal used to generate electricity. How can we say that nuclear power stations are not economical and functional?

Comrade Zuo Wu said that Esteemed and Beloved Comrade Zhou Enlai had inquired many times about our efforts in building nuclear power stations. Comrade Zhou Enlai's call for safety, utility, economy and self-reliance has up to now still remained as our guideline in building nuclear power stations. We must take self-reliance as the main factor and foreign aid as the secondary factor in the effort to build our nuclear power stations!

At the first congress of the nuclear society, Xu Guanren, director of the Atomic Energy Institute of the Chinese Academy of Agricultural Sciences, who is a research worker, sounded a clarion call for applying nuclear techniques to agriculture.

In the Spring Festival this year, Comrade Hua Guofeng received agricultural scientists, including Xu Guanren. Recalling the reception, Xu Guanren said to the reporters that he had briefed Comrade Hua Guofeng on what role the use of nuclear techniques at home and abroad had played in agriculture. Comrade Hua Guofeng listened with undivided attention. Xu Guanren felt greatly inspired.

It was in answer to Comrade Zhou Enlai's call in 1956 that Xu Guanren returned to the country from the United States. Comrade Zhou Enlai affectionately received him. He felt so moved that he wrote a poem: "So friendly and agreeable that it feels like the caressing spring breeze. The scent of 100 flowers is wafted to us by the breeze. So amiable and approachable that it touches my very heart. Every word of advice is engraved on my heart." For many years, thanks to efforts by the party Central Committee and Comrade Zhou Enlai, our Atomic Energy Institute achieved relatively great progress in its research. In 1957, the atomic energy utilization office of the Chinese Academy of Agricultural Sciences was established. Four years later, it was expanded as the Atomic Energy Institute. It not only trained backbone atomic agrotechnicians but

launched various scientific research activities. All provinces and municipalities also successively established isotope laboratories and other scientific research organs. Radiation has been used in selecting seed strains, stimulating growth, preserving foods, preventing and controlling insect pests, and so forth, with remarkable results achieved. Over 200 new varieties or strains of seed have been produced in our country by applying radiation to seed breeding. However, according to UN statistics, only 190-odd new varieties of seed have been developed by various countries in the world by using radiation. Xu Guanren said that in the new long march, he would surely dedicate the rest of his own life to atomic agricultural science. He would especially strive to extend the use of atomic energy to mass agriculture, forestry, fishing, stock-raising and processing.

On the morning of the same day, Wang Shizhen, deputy director of the Radiation Medicine Institute of the Chinese Academy of Medical Sciences, gave a report entitled "Atomic Nuclear Science and Technology and Modern Medicine." This aroused people's great interest. Wang Shizhen said, "What is meant by nuclear medicine? This is applying nuclear technology to diagnosing, treating and studying diseases. For instance, the flash camera that draws on nuclear technology can trace the beating of the heart in its different parts. In observing the spread of cancer cells, isotopes, like guided missiles, can trace the extent of spreading. The development of nuclear medicine has become an important mark of nuclear modernization. In the United States, of every three patients seeking consultation at present, there is on the average one receiving an isotope examination. U.S. law also stipulates that no hospitals with 250 beds or more must be allowed to operate without doctors of nuclear medicine, nuclear medical facilities and special nuclear clinics."

On the eve of the Spring Festival this year, Wang Shizhen received a notice requiring him to lecture on the development of nuclear medical research at the congress. [words indistinct] days, he devoted 2 days to looking up data and preparing the above report. Before liberation, Wang Shizhen studied abroad and engaged in nuclear medical research. After the founding of the new China, he returned to the motherland and witnessed the course of development of nuclear medicine. Since 1956, our country has boasted of 800 hospitals and medical research units using isotopes and about 2,000 specialized teams. But these are not enough to meet the needs of the four modernizations. He fervently hoped that he would take nuclear medicine as the focus of development and establish a well-trained comprehensive team. Meanwhile, we must obtain some necessary nuclear medical equipment and step up international exchange efforts. We must strive to achieve something within the shortest possible time to win honor for the motherland.

During the congress, the scientists pointed out that atomic science and technology is one of the three important marks of modern science and technology. It is an important part of the effort to modernize science

and technology and national defense. Therfore, we must energetically coordinate our efforts and win the battle to develop atomic energy. Wang Ganchang, president of the Chinese Nuclear Society and a well-known nuclear physicist, appealed to everyone: "Unity must be achieved between different departments, between different sciences and between individuals. Just like electrons spinning around atomic nuclei, all our work must revolve around a center. This calls for uniting our efforts to promote the four modernizations and to further develop nuclear science!"

The first congress of the Chinese Nuclear Society lasting a week has ended. The representatives will soon head for their respective posts and bestir themselves to forge ahead in developing atomic science and technology.

Nuclear science and technology must thrive in all trades and profcssions with thousands upon thousands of gorgeous golden flowers in full bloom....

CSO: 4008

APPLIED SCIENCES

SCIENTISTS ANALYZE U.S.-DONATED MOON ROCK

OW030740 Beijing XINHUA in English 0730 GMT 3 Apr 80 OW

[Text] Guiyang, April 3 (XINHUA)--Chinese scientists have made encouraging progress in analysing a rock sample taken from the moon by U.S. astronauts during the Apollo 17 mission, and reported their results in twelve research projects at a symposium held last month in Guiyang, capital of Guizhou Province.

The moon rock sample, approximately 1 gramme in weight, was handed over to Premier Hua Guofeng by Dr. Zbigniew Brzezinski, assistant to the President of the United States for national security, during his visit to China in May 1978, as a gift from President Jimmy Carter. About 0.7 gramme of the rock was divided in April last year among eight Chinese research institutions for analysis.

The Chinese scientists announced at the symposium that the data they had obtained tallied with those reported in other countries. They concluded that the rock fragment was of medium-grain high-titanium mare-basalt.

The work ranged from the study of structural characteristics of the surface of impacted lunar rock, of mineral components and formation conditions, and of chemical composition and rare and rare-earth elements of lunar rock, to the study of the structural characteristics and physical-chemical formation environment of lunar rock.

The research on lunar rock is an entirely new area of study in China. The work has also advanced the study of meteorites and astro-chemistry in this country. It also marks a higher level that China has reached in analysing and measuring techniques, which included neutron activative analysis, proton induced x-ray analysis, spark source mass spectrometer, electron spectrometer for chemical analysis, electron microprobe and thermoluminescence. This made it possible to obtain large amount of data in a brief period of time from a small amount of the sample.

The research results will soon be published in the magazine GEOCHEMISTRY.

CSO: 4020

SIX-CHANNEL NUCLEAR FUSION LASER

Beijing RENMIN RIBAO in Chinese 17 Mar 80 p 4

[Photograph and Caption]

Coordinating with concerned units, the Shanghai Institute of Optics and Precision Instruments of the Chinese Academy of Sciences has set up a 6-channel laser nuclear fusion installation and associated measurement devices and spherical targets [pellets] and will conduct systematic physical experiments; they will discharge neutrons and observe the compression effect. Important advances will be made in the research on laser nuclear fusion.

CSO: 4008

INFLUENCE OF CHINE STRIPS ON RESISTANCE OF HIGHSPEED DISPLACEMENT HULL FORM

Wuxi ZHONGGUO ZAOCHUAN [JOURNAL OF SHIPBUILDING OF CHINA] in Chinese Jan 79 pp 43-50

[Article by Shao Shiming [6730 0013 2494] and Wang Yuncai [3769 0061 2088]: "The Influence of Chine Strips on Resistance and Motions of Highspeed Displacement Hull Form"]

[Text] High speed displacement hull forms occupy an important place in the field of highspeed craft. Performance requirements for these craft are: high speed and seaworthiness. Fitting of chine strips along the chine is the chief means of satisfying these requirements.

This article discusses the effects of chine strips on resistance, rolling, pitching, heaving, loss of speed, and the turning performance on highspeed displacement hull forms, largely on the basis of the results of experimental research with models.

Foreword

So-called transitional speedboats with speeds between that of ordinary displacement boats and planing boats occupy a rather important position in the field of highspeed craft. Though speeds for these craft are rather high, their attitude of movement is not that of total planing. Owing to their weight, they rely for support principally on the buoyancy of calm water and thus they are frequently called highspeed displacement boats. Performance requirements for these craft may be generally stated as: highspeed and seaworthiness.

This article discusses the effects of chine strips on highpeed displacement boats, largely on the basis of experimental research with models.

(1) Brief Introduction to Models and Chine Strips

Pertinent results of experimental research on chine strips has demonstrated that when proper chine strips are installed on the chine line of V-bottomed boats, they have a definite effect on both control of spraying and in increasing the lift at the bottom of the hull. (1) (2) (3)

In order to explore the effects of cross pulse on the seismic of high-speed trapezoidal bodies, experiments with models of two base types were conducted.

Model AB-2001 is a constant-curvature bridge span profile, whose model AB-2002 is a poststressed bridge span length. Because from the box on the points pressure in a compression cross, the full lengths or depth measurement on the cross-flow span a 3-degree. A cross-sectional view of these tests is shown in Figure 1. Tests in progressive measurements and the transducers at each station are shown in Table 1. The AB-2001 model has a bridge deck, in addition that is 30 centimeters to transport (1.0 percent W), and 67% points square in length (0.1 percent C). The bridge deck has been instrumented along the line of flow of the bridge. In the AB-2002 model a cross wire have along the entire length of the cross flow and is 10 centimeters to transit, and 1.067 centimeters in length (Ds.) percent C). The difference between were used with the cross section. The rate in both the average the cross line to the same place as the bottom of the model. The model has to have the stress have been especially from the test. Both are shown in Figure 1. This was done in order to be able to compare the effect of the cross section on the running performance of the tests.

Table 1. Main Characteristics of the Models

	Model Number	
	AB-2001	AB-2002
Length on cross flow (L) (in centimeters)	1.07	1.07
Comparison of length to breadth (L/B)	1.74	1.74
Comparison of breadth and depth (B/D)	1.50	1.50
Displacement (D) (in pounds)	50.00	80.00
Center of buoyancy coordinate C_b (centimeters of L)	0.5 (length of mid-section)	0.5 (length of mid-section)
Square coefficient	0.00	0.007
Cross-section coefficient	0.000	0.000
Prism line coefficient	0.007	0.700
Displacement coefficient	0.000	0.000

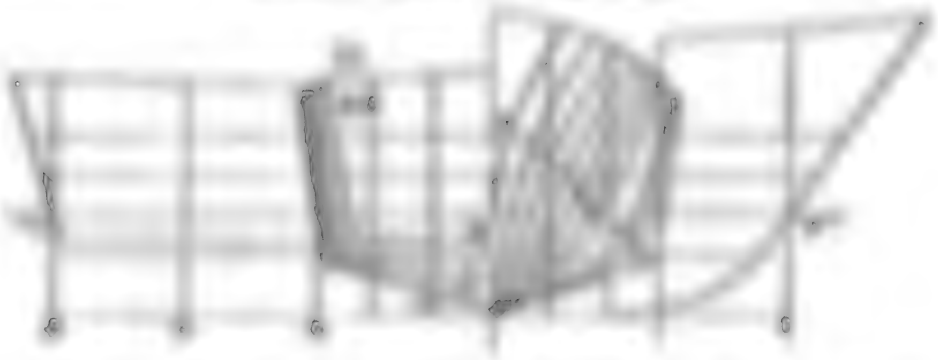

Figure 1. [illegible]

Note: [illegible]

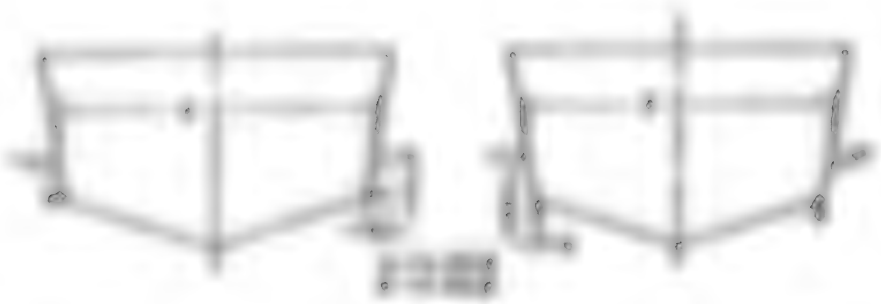

Figure 2. [illegible]

(b) Design of three bridges on basis

[illegible] Reconnaissance work first conducted for select three sites can be summarized as to be able to enlight the preliminary survey plan layout alignments for each site. Details of the reconnaissance are shown in the concept lines for reconnaissance in Figure 1. It can be seen from this figure that actual reconnaissance lines for the three bridge sites that for the 3 bridge sites. When the grade, speed and [illegible] are assumed [illegible] the values formula number 6, [illegible] the economics of the three bridge sites that are shown in Table 3.1 [illegible].

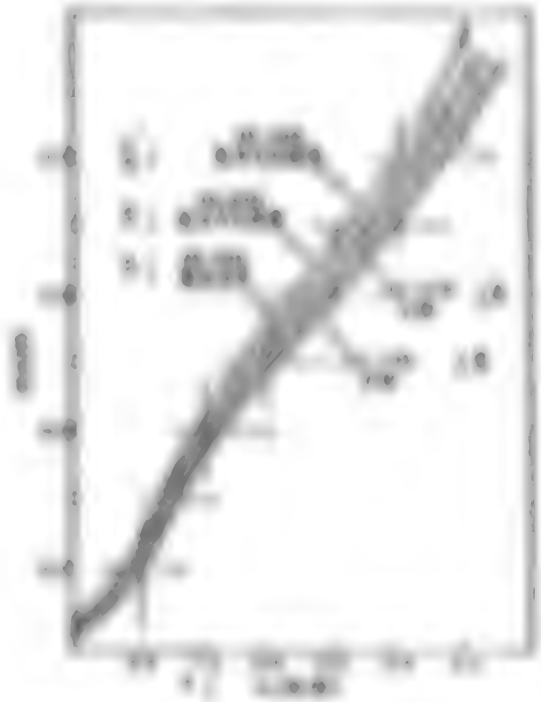

Figure 1. [illegible] reconnaissance lines

Where: [illegible]

Reconnaissance (a) (b) and (c) have shown that on a specific spread hanger, reconnaissance is done to bridge that are 3-staged to cross section that is angular bolts that are 3-staged to cross section. But after a suitable spread has been considered, the reconnaissance to the bridge begin improves, and this improvement to the section marks the beginning of planning by the hull on the condition of the spread. The characteristics value of the spread is

[redacted]

3. Comparison of Chine Wings and Bilge Keels

The addition of chine strips and bilge keels are primarily for the sake of manoeuvrability, and particularly in order to improve rolling. But installation of these kinds of appendages to the hulls of the yacht increased yaw drag. Consequently, resistance experiments were carried out on the Delft ship model with a bilge keel had been fitted, and the Delft ship model with chine strips had been fitted. Results of these experiments are also shown in Figure 2. The figure shows that at the speeds the bilge keel has greater resistance than the round bilge craft, but at the speed increment, resistance values for the 2 keels tended to become closer (F_{n_∇}) except for second keel/wheel at F_{n_∇} = 1.6), the bilge keel's resistance became less than that of the round bilge keel. Clearly this was different from the result of the resistance results for the chine model.

When the chine strips were installed on the bilge keel, resistance became less than on the round bilge keel at high speeds. This was because at this stage the Froude number for the keel's volume Fr_∇ was rather high (becoming Fr_∇ > 2.0). Though the keel's hull had not yet reached the planing stage, it had actually entered a semi-planing stage, and the amount of displacement also started to rise. Therefore, installation of the chine strips brought about an increase to the lift-to-drag ratio on the planing surface, and with a steady increase in speed, this effect would also increase. The experimental results of the data provided in (i) and (j) demonstrate that given a planing surface of the same oblique lift angle, installation of horizontal chine strips will increase lift by more than 10 percent, and at the oblique angle of lift increases, the effects of the lifting force will become more pronounced. If either chine strips or bilge keels are installed, resistance increase greater than with a naked hull. True, the wet surface of the bilge keel is greater than that of the horizontal chine strips, but when v_s = 6.3 knots are reached, the increase in resistance caused by installation of chine strips is only 1.9 percent, while resistance is increased by 7.6 percent when a bilge keel is installed on a round bilge keel. The disparity between the two appears to be compensated by the disparity in wet surfaces. It may be seen that it is principally because horizontal chine strips are lighter than bilge keels in resistance characteristics.

(2) Effects of Chine Strips on Resistance

The effects of chine strips on resistance, particularly whether or not they have noticeable effect on roll or reducing roll, is an important factor affecting whether they would be valuable on actual boats. For this reason pertinent experiments were conducted.

3. Experiments With Roll in Calm Water

By experimentation with rolling attenuation using the models in calm water, rolling damping coefficients could be obtained, and these were important parameters in measuring rolling characteristics. We conducted rolling attenuation experiments with the JH-2031 and JH-2032 models, postulating the relationship between the roll damping and the angular velocity to be a pure law of square, and using the experimental data to calculate the roll-damping values presented in Table 2.

Table 2. Roll Damping Values

Type / Item: Damping	JH-2031 (Round-bilge type)		JH-2032 (V-bilge type)	
	Naked boat	With bilge keel	Naked level	With water level strips
a(1 per second)	0.0069	0.0129	0.0095	0.0235

The data in Table 2 show that because JH-2031 has a V-bilge, resistance damping is fairly great, and once it was fitted with chine strips, its resistance damping was greater. Particularly deserving of attention is that even though the width of the bilge keel was twice that of the chine strips, resistance damping values were only half that of the latter. The attenuation curves (Figure 4), derived from the experiments, show that after installation of the horizontal chine strips, reduction in roll was extremely pronounced.

4. Experiments With Increased Rolling From Regulated Waves

Frequency response curves for situations in which identical waves were created are shown in Figure 5. Comparison of the curves in the figure show that even though the peak value of the curve following installation of the bilge keel on the round bilge boat was much less than when the hull was naked, it was still somewhat larger than the naked hull on the V-bilge boat. The difference was even greater when horizontal chine strips were installed on the V-bilge boat, whose its ** highest value was almost double.

If Figure 5 is used as a transfer function for applying statistical theory to the calculation of the width of the angles of roll for a boat

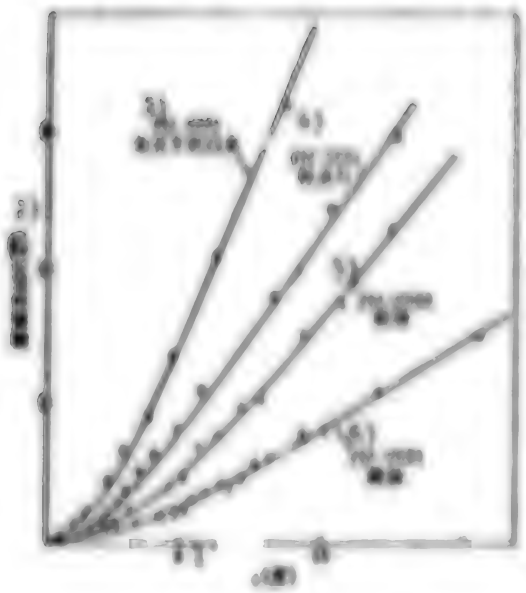

Figure 4. Extinction curves

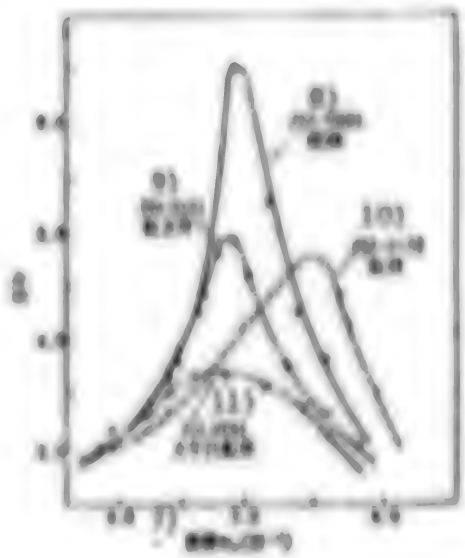

Figure 5. Frequency response curves

Key: 1) Extent of roll θ_a (degrees)
2) Attenuation angle $\Delta\theta$ (degree)
3) JM-2032 with horizontal chine strips
4) JM-2031 with bilge keel
5) JM-2032 with naked hull
6) JM-2031 with naked hull
7) Wave frequency ω_e (seconds $^{-1}$)
8) JM-2031 with naked hull
9) JM-2031 with bilge keel
10) JM-2032 with naked hull
11) JM-2032 with horizontal chine strips

in waves that are not controlled, given identical sea conditions, the extent of roll was least on the V-bilge boat fitted with horizontal chine strips. Inasmuch as the roll of ships and boats is usually not linear in character, possibly the frequency response curves obtained in the model experiments are not unique. (For example, the frequency response curve for the same model in different wave conditions was frequently not constant.) But since this experiment was conducted with identical wave conditions, the relative relationship between each of the frequency response curves in the figure still reflect the essence of things. Thus, it can be estimated in advance that V-bilge hulls fitted with chine strips will show fine performance characteristics for rolling in swells.

3. Experiments with Pitching and Heaving

Experiments were conducted with pitching and heaving in regulated waves using the JM-2031 (fitted with bilge keel) and the JM-2032 (fitted with horizontal chine strips), and then, on the basis of transfer function curves, performance estimates were made for actual boats in unregulated waves. Table 3 shows results of calculations when wave heights are one-third high, $H_{1/3}$ = 2.0 meters.

Table 3. The estimated value of pitching and heaving on an irregular wave

$Fr_D = \frac{v}{\sqrt{gD}}$	pitching and heaving values							
	JM-2031 fitted with bilge keel				JM-2032 fitted with horizontal chine strips			
	$\theta_{1/3}$	$\theta_{1/10}$	$z_{1/3}$ (in meters)	$z_{1/10}$	$\theta_{1/3}$	$\theta_{1/10}$	$z_{1/3}$ (in meters)	$z_{1/10}$
0	3.51	4.48	0.61	0.77				
0.99	5.32	6.79	0.79	1.01	4.67	5.95	0.80	1.02
1.42	5.29	6.74	0.97	1.24	4.47	5.70	0.94	1.20
1.86	4.23	5.40	1.03	1.31	3.88	4.95	1.05	1.33
2.24	3.52	4.48	0.95	1.22	3.26	4.16	0.93	1.19

Figure 6 shows pitching and heaving random speed change curves. The amplitude of pitching is less on V-bilge boats fitted with chine strips than on round bilge boats fitted with bilge keels. Particularly noticeable is the reduction in the extreme value of pitching (around Fr_D = 1.17) where amplitude is about 14 percent less. Both types were about the same for heaving with their heaving values increasing as Fr_D increased. At around the point where Fr_D=1.83, an extreme value for heaving appeared.

In addition, experiments with resistance on the models were conducted with controlled waves. Both models were used and calculations were made for increased resistance values with uncontrolled waves for actual boats. Supposing effectiveness in making way in waves and in calm water to be the same, it was possible to calculate, on the basis of effective horsepower, the speed loss for real boats in waves. Table 4 shows speeds attainable at different effective horsepowers for actual ships like the two models in calm water and in controlled waves (taking wave heights of one-third for the two, $H_{1/3}$ = 2.0 meters, $H_{1/3}$ = 4.0 meters). From Table 4 may be seen that when speed is quite low, loss of speed for the V-bilge JM-2032 boat was less than for the round bilge boat, but when speeds were fairly high, speed loss was quite serious.

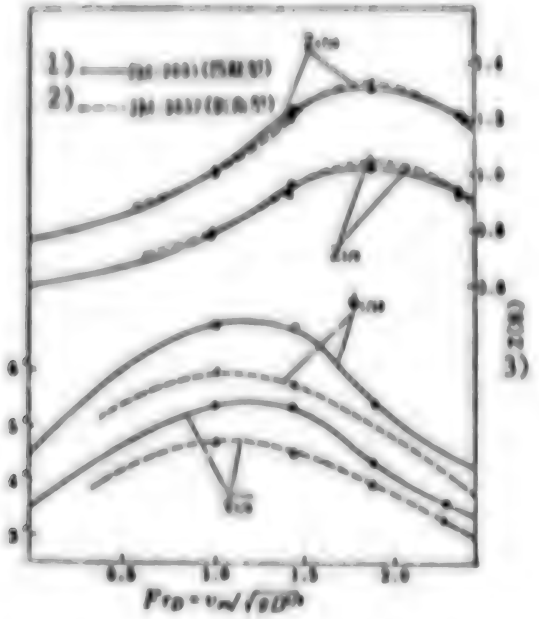

Figure 6. Curve of variation of the pitching and heaving following Fr_0

Key: 1) JM-2031 (round bilge)
2) JM-2032 (V-bilge)
3) (in meters)

Table 4. Calculation of Speeds in Waves

Boat Type	Effective Horsepower P_E	1000	1500	2000	2500
JM-2031 fitted with bilge keel	Speed in calm water	21.22	25.35	28.60	31.30
	Speed when $H_{1/3}$ = 2.0 meters	20.00	24.00	27.52	30.30
	Speed when $H_{1/3}$ = 4.0 meters	18.60	22.00	25.68	28.90
JM-2032 fitted with horizontal chine strips	Speed in calm water	21.15	25.20	28.50	31.25
	Speed when $H_{1/3}$ = 2.0 meters	20.42	23.75	26.70	29.40
	Speed when $H_{1/3}$ = 4.0 meters	20.00	22.35	24.35	26.50

(4) Effects of Chine Strips on Turning

When V-bilge boats are fitted with horizontal chine strips, not only does speed improve but outstanding results are also obtained in reducing rolling. Experiment and evaluation with actual ships attests to the accuracy of the above conclusion. Turning experiments using an actual ship like the JM-2032 revealed that when the main engine was at full power and the rudder at the full (the rudder angle being 30 degrees), the turning diameter was 4.7 times the boat length. Its numerical value was somewhat greater than for the same type round bilge boat, but generally speaking, its turning performance satisfied requirements for use. A shortcoming of this ship type appeared with the angle of rolling during turning being greater than for round bilge type boats when the rudder was operated at a small angle. In actual operation, this would have a bad effect on operation of the rudder.

That operation of the rudder which caused the craft to roll was due to the rolling moment created by the crosswise hydrodynamics. V-bilge craft fitted with horizontal chine strips have a rather large roll when on small rudders simply because of the effect on the rolling moment of the horizontal chine strips and the chine line of the hull of the craft itself.

1. Experiments To Test Pressure in a Wind Tunnel

In order to explore the effects on the rolling moment of the linearity of the craft's body and of the horizontal chine strips, definitive experiments were conducted in a wind tunnel. Selected for use in the tunnel were two-dimensional superimposed models whose profile was made up of cross sections of the JM-2031 and the JM-2032. Experiments to test pressure in the wind tunnel were first conducted on the two ship types using naked models.

Figure 7 shows the distribution of the tested pressures from crosswise flow. It may be seen from the pressure distribution curve that the distribution of pressure on both sides of the JM-2031 cross section were virtually symmetrical, and consequently the rolling moment brought to bear on the craft's hull was very small. In the case of the JM-2032 cross section, however, pressure on one side was noticeably greater than on the other, and consequently the rolling moment on the craft's hull was quite great.

Figure 8 shows the distribution of pressure when the same experiments were performed following installation of horizontal chine strips on the JM-2032 model. A comparison of Figure 8 with Figure 7 shows that following installation of the chine strips, distribution of pressure on the one side of the cross section showed virtually no change, while the distribution of pressures on the other side was further reduced. This lead to a more serious assymmetry in the distribution of pressures on the two sides. The inevitable result was that after the JM-2032 was fitted with chine strips,

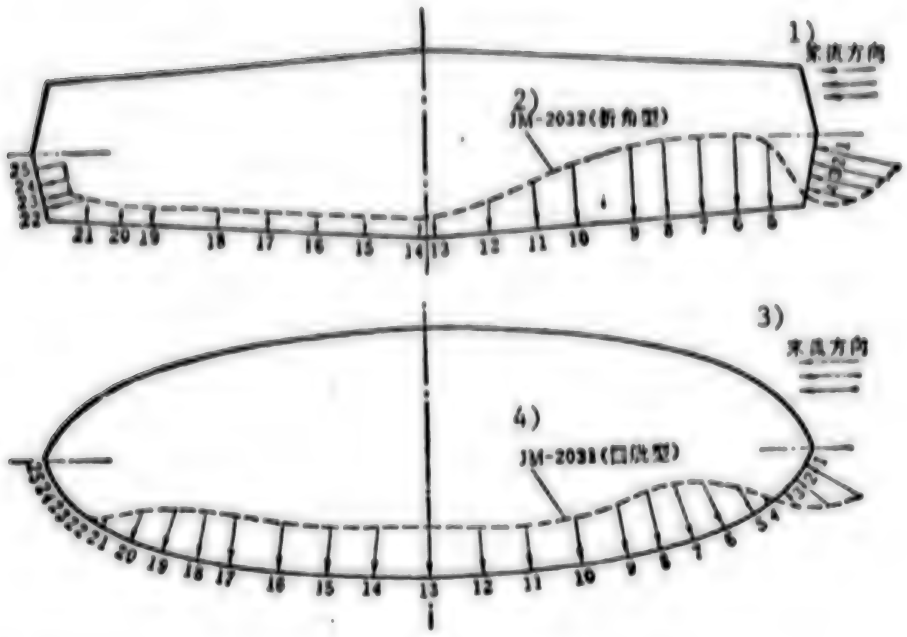

Figure 7. Pressure coefficients for two types of craft

Key: 1) Direction of flow
2) JM-2032 (V-bilge)
3) Direction of flow
4) JM-2031 (round bilge)

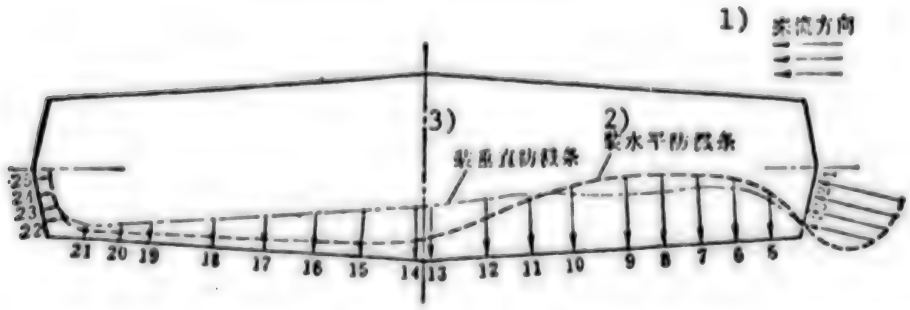

Figure 8. Pressure coefficients for JM-2032 fitted with chine strips

Key: 1) Direction of flow
2) Fitted with horizontal chine strips
3) Fitted with vertical chine strips

the rolling moment was even greater than with the naked hull. The results of integral calculation of pressure shows its value to be about 10 percent greater. Therefore, qualitatively both the linearity of the V-bilge and the chine strips will increase the roll angle of a real craft when turning.

2. Exploration of a Plan To Improve Chine Strips

In order to obtain a rather small moment of motion, experiments were conducted with different schemes for the measurement of the chine strips on the hull of the craft and on their position there. Results show that changes in the sizes of the chine strips produce no noticeable effects on the distribution of pressure, but changes in the positions of the chine strips produce rather great effects. When the chine strips are installed vertically a very great improvement occurs in the asymmetrical distribution of pressure on both the left and right sides, as shown in Figure 8. It is calculated that the moment of motion is only 62 percent of what it had originally been. If the vertical chine strips are moved to a position one-fourth the width of the bottom of the craft and installed symmetrically, the effects are better, with the moment of motion becoming only 32 percent of what it had been when the chine strips were horizontal (which is to say that the moment of motion is reduced by 68 percent). However, should four shaft propellers be installed on this type craft, this plan would have very little application.

(5) Effects on Resistance and Rolling of Vertical Chine Strips

After the horizontal chine strips were changed to vertical chine strips, the goal of a reduction in the moment of motion during turning was achieved, but the experiment showed a worsening of other characteristics.

1. Slight Increase in Resistance

Once the chine strips had been changed from the horizontal position and installed vertically, some increase occurred in resistance in calm water at any and all speeds. (See resistance line in Figure 3.) As speed increased, resistance mounted. For example as $Fr_D = 2.2$ ($v_m = 4.5$ meters per second), an increase of 8 percent would take place.

2. Reduction of Damping of Rolling

Under the same parameters for rocking back and forth, results of experiments with calm water rolling showed that when the chine strips were changed to the vertical position, there was a noticeable reduction in the damping values of the rocking as compared with horizontal chine strips. Decrease in damping amounted to about 30 percent overall.

Increase of Rocking for an Actual Craft in Uncontrolled Waves

Separate experiments were conducted with the chine strips installed in both positions on the attenuation of rocking in calm water and with controlled

waves at variable speed in a beam sea. The amplitude of the rocking angle with uncontrolled waves for an actual ship was then estimated. Both the estimating method using the frequency response curves, and the nonlinear random formula for solving rocking showed the same results: when the same spectrum was used for the same one-third wave height, the rocking angle was greater with the vertical chine strips than with the horizontal chine strips. Figure 5 shows the results of estimates for actual craft using one-third wave height, $H_{1/3}$ = 4.0 meters.

Figure 5's rolling parameters Z_g and T_θ are the center of gravity vertical coordinates and the free rolling period respectively. The ITTC spectrum was used in the calculations. Since the nonlinear effects were not calculated in the frequency response curve method of calculation, the numerical values are larger than if they had been calculated using nonlinear random formula calculations.

The following conclusions may be drawn from a summarization of the above. After horizontal chine strips have been installed along the chine on a V-bottomed highspeed displacement hull, benefits accrue in resistance and rolling characteristics, but when little rudder is used in turning, the angle of roll is rather great with bad effects for rudder control. If the horizontal chine strips are converted to vertical chine strips, suitable improvements occur in rolling while turning; however, loss of speed will result on actual ships and rolling in high seas would be worse. Thus, in considering the configuration to be used in installing chine strips, the various conflicting circumstances must be analyzed, the advantages and disadvantages weighed, and selection made on the bases of the needs of the situation.

Table 5

Angle of rolling (degrees)	Chine Strip / Parameters for rolling	Installed horizontally		Installed vertically		Naked
		Z_g=2.20 mtrs	2.10 secs	2.20 mtrs	2.10 mtrs	2.20 mtrs
		T_θ=5.00 secs	4.48 secs	5.00 secs	4.48 secs	5.00 secs
$\theta_{1/3}$	by equation reduction	12.54	12.90	15.14	16.92	20.00
	by transfer function	13.90	14.30	16.50	17.10	20.70
$\theta_{1/10}$	by equation reduction	16.00	16.45	19.30	21.57	25.50
	by transfer function	17.70	18.30	21.10	21.80	26.50

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APPLIED SCIENCES

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Beijing DIZHEN DIZHI [SEISMOLOGY AND GEOLOGY] No 1, 1979

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AUTHOR: [redacted] Baoke [1728 0202 0715]

ORG: Institute of Acoustics, Chinese Academy of Sciences

TITLE: "[redacted]-Averaged Sound Field in Underwater Sound Channel"

SOURCE: Beijing [redacted] XUEBAO [ACTA ACOUSTICA] in Chinese No 2, May 1979 pp 100-108

TEXT OF ENGLISH ABSTRACT: In this paper, by use of a generalized phase-integral approximation, the difficulty of the classical WKB approximation which diverges at the turning point is overcome, and then the general expressions of the [redacted]-averaged sound field in underwater sound channel are obtained. For the bilinear sound channel the discussion is done in detail, and the Brekhovskikh's [1, 2] result is improved.

Received 11 October 1978.

AUTHOR: [redacted] Baoke [1728 0202 0715]

ORG: Institute of Acoustics, Chinese Academy of Sciences

TITLE: "Effects of Sea-Surface and Medium Fluctuations on Coherence of the Different Paths"

SOURCE: Beijing [redacted] XUEBAO [ACTA ACOUSTICA] in Chinese No 2, May 1979 pp 109-111

TEXT OF ENGLISH ABSTRACT: In this paper an approximate method to calculate correlation coefficient of different paths is given. Some concrete examples are discussed and some significant results are obtained.

Received 28 April 1978.

AUTHOR: WU Chengyi [0702 2110 3030]

ORG: Institute of Acoustics, Chinese Academy of Sciences

TITLE: "Calculation of Shallow Water Reverberation Intensity Based on Ray Theory Part (1)"

SOURCE: Beijing SHENGXUE XUEBAO [ACTA ACUSTICA] in Chinese No 2, May 1979 pp 114-119

TEXT OF ENGLISH ABSTRACT: In this paper, the average intensity of shallow water reverberation in homogeneous layer is calculated based on ray theory, while the projector and receiver are both directional and at the same place. The calculation and approximation formulae are derived, and the transition range of short range and long range are also discussed.

Received 21 November 1978.

AUTHORS: ZHU Weiqing [2612 4850 1987]
GUAN Zhihe [7070 5268 0735]
WANG Yunyu [3769 5686 3768]

ORG: Institute of Acoustics, Chinese Academy of Sciences

TITLE: "Mean-Square Beam Patterns of a Linear Array"

SOURCE: Beijing SHENGXUE XUEBAO [ACTA ACUSTICA] in Chinese No 2, May 1979 pp 120-125

TEXT OF ENGLISH ABSTRACT: In this paper, the effects of correlated phase fluctuation and correlated amplitude fluctuation on the linear array performance are discussed, and the expression of mean-square beam patterns is obtained.

When the element number is enough large, simplified expressions are obtained.

Receive 30 October 1978.

AUTHORS: SHEN Hao [3088 1472 6275]
CHEN Dingchu [7115 1353 2806]
MAO Hongdi [5403 1347 6611]

ORG: Institute of Acoustics, Chinese Academy of Sciences

TITLE: "Acoustic Fatigue and Failure of Metal Sheets"

SOURCE: Beijing SHENGXUE XUEBAO [ACTA ACUSTICA] in Chinese No 2, May 1979 pp 126-133

TEXT OF ENGLISH ABSTRACT: Modern supersonic aeroplanes produce a high-intensity noise level up to 155 dB near the jet nozzles, which is enough to cause acoustical fatigue and failure. We used the electro-pneumatic loudspeaker coupled directly to the travelling-wave tube to produce about 165-170 dB of the high-intensity random sound field in the test section. This paper studied experimentally for three types of the metal sheets, i.e. type Ly12-CZ-δ 0.8, type Ly12-CZ-δ 1.0 and type 1Cr18Ni9Ti-0.6. Under such sound field, we observed the whole process of the crack initiation, growth, propagation and failure, and compared the acoustical fatigue of the different structures and obtained experimentally the L_p-t curves of the 0.8 mm and 1.0mm aluminum sheets, and 0.6 mm stainless steel sheet.

Received 30 October 1978.

AUTHORS: SONG Zhiyung [1345 4249 3938]
ZHANG Jialu [1728 1367 7498]

ORG: Institute of Acoustics, Chinese Academy of Sciences

TITLE: "On the Average Spectra of the Glottal"

SOURCE: Beijing SHENGXUE XUEBAO [ACTA ACUSTICA] in Chinese No 2, May 1979 pp 134-140

TEXT OF ENGLISH ABSTRACT: An average spectrum which is used for precisely measuring the spectrum of vocal tract is proposed and some computing results derived from a simplified model of the glottal wave are presented in this paper. The effects of duty factor, asymmetry of the triangular wave on the average spectra are considered. The average spectra of the four Tone in standard Chinese are given individually.

A comparision between the average spectrum and traditional representation of the glottal wave is made.

Received 11 October 1978.

10424
CSO: 4009

AUTHOR: ZHANG Minghua [1728 7686 5478]

ORG: Qinghua University

TITLE: "Global Data Flow Analysis"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese Vol 2, No 2 Apr 79 pp 81-98

TEXT OF ENGLISH ABSTRACT: For global data flow analysis various algorithms have been developed [1-5]. It is well-known that all these agorithms are to obtain the minimal solution of Boolean equations. The main trouble comes from the presence of "diagonal terms" in the equations. In this paper it is proved that the "diagonal terms" have actually no influence on the minimal solution, i.e. if we alter or even omit the "diagonal terms," the minimal solution remains unchanged. Thus two transformations on Boolean equations can be introduced and a new algorithm can be devised which, unlike the algorithms mentioned above, imposes no restrictions on the flow graph of the problem.

Moreover, through these transformations we can gain a better insight into the algorithms of Cocke-Allen and Kennedy.

Received 15 August 1978.

AUTHOR: QU Yanwen [1448 1693 2429]

ORG: Huabei Institute of Computing Technology

TITLE: "Sequential Circuit Model With Fuzzy Border"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese Vol 2, No 2 Apr 79 pp 112-124

TEXT OF ENGLISH ABSTRACT: In this paper the sequential Circuit model by Huffman is revised. The nature of fuzzy border set is investigated. The sequential Circuit model with fuzzy border is set up on the bases of Boolean differential and fuzzy border set. By studying the grade of distinctness of fuzzy prick-shaped pulse. The criterion of the fuzzy state of the sequential circuit is finally put forward. Thus, the sequential circuit model described in this paper provides an evidence for a real algorithm of generation of fault test of sequential circuit and algorithm of generating test of fuzzy state of sequential circuit (logic correctness checking).

AUTHOR: XIAO Jingxiao [5618 2417 1321]

ORG: The Institute of Computing Technology, Chinese Academy of Sciences

TITLE: "An Experimental Holographic Digital Memory"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese Vol 2, No 2, Apr 79 pp 125-135

TEXT OF ENGLISH ABSTRACT: An experimental mockup of holographic read write memory and speed are briefly described in this paper. The analysis shows that the capacity up to 10^9 to 10^{10} bits and an access time much shorter than that of the disc can be realized, if some key materials and devices can be otained. The holographic memory, besides the disc memory, is a promising approach to mass storage.

Received 29 June 1978.

AUTHOR: LUAN Yumin [2940 3022 2404]

ORG: Institute of Computing Technology, Chinese Academy of Sciences

TITLE: "The Fundamental Parameters of the Twisted-Pair Lines"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese Vol 2, No 2 Apr 79 pp136-149

TEXT OF ENGLISH ABSTRACT: The important parameters of the twisted-pair lines such as capacitance, inductance and transmission delay time per unit length, as well as the characteristic independence of the transmission lines are discussed. These parameters effected by the geometric size and dielectric constants will be analyzed. Some of the current inexact ideas are reviewed, and some of the design considerations about the twisted-pair are presented. The calculation formulae and normalized curves are also presented in this paper.

Received 31 March 1978.

AUTHOR: YANG Dongbing [2799 2639 1456]

ORG: Institute of Computing Technology, Chinese Academy of Sciences

TITLE: "Operator Gap Theorem"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese Vol 2, No 3 Jul 79 pp 163-173

TEXT OF ENGLISH ABSTRACT: In 1967 M. Blum published the first article on abstract computational complexity theory. Now abstract computational complexity theory becomes an important subarea of ordinary recursion theory. It also belongs to computer science.

B. Jacobs lifted the abstract computational complexity theory to a-recursion theory and gained a new subarea of -recursion theory. Jacobs called it generalized computational complexity theory.

Jacobs lifted many results of abstract computational complexity theory to generalized computational complexity theory, one of which is a-gap theorem. He also asked whether Constable's operator gap theorem can be lifted to generalized computational complexity theory. We have solved it in this article.

[Continuation of JISUANJI XUEBAO Vol 2, No 3 Jul 79 pp 163-173]

The a-operator gap theorem can be formulated as follows:

For all a-computational complexity measures $\tilde{\Phi}$, for all a-total effective operators F, there are arbitrarily large increasing a-recursive function t such that if

$$t(\xi) \leqslant \Phi_{\cdot}(\xi) \leqslant F[t](\xi)$$

for an unbounded set of ξ, then

$$F[t](\eta) < \Phi_{\cdot}(\eta)$$

for an unbounded set of η.

We followed Constable's strategy, but there was an obstacle that we had no a-recursive version of Kriesel, Lacombe, Shoenfield theorem. This obstacle has been removed by establishing a weaker a-recursive version of the K. L.S. theorem and been used as a tool in the proof.

Received 5 June 1978.

AUTHOR: ZHOU Chaochen [0719 1560 1057]

ORG: Institute of Computing Technology, Chinese Academy of Sciences

TITLE: "Program Schemas and Predicate Calculus"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese Vol 2, No 3 Jul 79 pp 174-189

TEXT OF ENGLISH ABSTRACT: This paper consists of two major parts. The first part shows how to reduce the unsatisfiable problem for AEA formulae to the halting problem for schemas conservatively. Thus we obtain the same results as Luckham-Park-Paterson's.

The second part is related to the decidable cases of schemas. A much bigger decidable class than Ianov's is found out. It may be characterized by the restriction that the term which occurs in schemas is restricted to the form of $f(y_1, y_2, \ldots, y_n)$.

At the end of this paper, the differences between general mechanical theorem proving and mechanical schema property proving are considered. In general, it is not necessary to go through the whole Herbrand domain for eliminating

qualifiers in mechanical schema property proving, but a subdomain. Furthermore, this subdomain can be arranged as an infinite tree with uniformly bounded branches at each node. And we may only test a special satisfiability, called path-satisfiability, instead of the general one.

Thanks are due Teacher Hu Shihua [5170 0013 5478] for counsel. Received 29 May 1978.

AUTHOR: WANG Gonghao [3769 0361 8504]

ORG: Institute of Computing Technology, Chinese Academy of Sciences

TITLE: "Emitter Coupled Circuit--'109D' Series"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese Vol2, No 3 Jul 79 pp 205-223

TEXT OF ENGLISH ABSTRACT: The "109D" series is a family of small scale ECL integrated circuit designed and manufactured in China, since 1972. The parameters of the performance and reliability of this series satisfy all the design requirements and have been verified by its application in a large computer.

The fundamental analysis of a typical ECL circuit shown in the first section of this article is the background of "109D"'s design and production. In the second section some measures taken in the manufacturing process are given. The "109D" series itself is presented in third section.

Thanks are due He Jin [0149 2516] and other colleagues for providing data, as well as Plant No 109 and ECL Research and Manufacture Section, Institute of Computing Technology, for research and manufacture of "109D" series. Received 21 November 1978.

AUTHOR: XU Xingsheng [1776 5281 5116]

ORG: Institute of Computing Technology, Chinese Academy of Sciences

TITLE: "A Vector Register Circuit of Shift Register Mode"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese Vol 2, No 3 Jul 79 pp 224-233

TEXT OF ENGLISH ABSTRACT: In this paper the structure features and performance of a high-speed shift register which is used as vector register are discussed and analysed. The analysis is verified by computer-aided calculation. The test method concerned is also demonstrated.

Finally, an experimental model of vector registers with 16 bits x 32 words is described.

Thanks are due YANG Shaoqi [2799 4801 4388] of Third Laboratory, Institute of Computing Technology, for counsel; LIANG Peiji [2733 1014 1015] of First Laboratory, Institute of Computing Technology, and other colleagues of the Fifth Shop for assistances; and Plant No 109 of Chinese Academy of Sciences for providing devices used in experimentation. Received 30 August 1978.

AUTHORS: XU Degao [1776 1795 7559]
PANG Dawei [1690 1129 0251]

ORG: Chinese Academy of Sciences

TITLE: "Analysis of Collector Voltage Spikes of High-Voltage Switching Used in Half Bridge Converter with Pulse-Width Modulation"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese Vol 2, No 3 pp 236-242

TEXT OF ENGLISH ABSTRACT: The pulse-width modulation converter operating directly on the main is a new type of power supply and has been utilized as the main power supply for the electronic computer systems. When the high voltage switching transistor is turned off, the spikes generated at the collector will damage the transistors. A lot of work has been done to limit spikes by selecting properly RC networks experimentally. In this article the transient process, especially the voltage spikes of the converter is discussed. With the aid of electronic computer, the computing results agree well with the experiments.

Received 18 November 1978.

10424
CSO: 4009

AUTHORS: SU Zefeng [5685 3419 1496]

ORG: None

TITLE: "On Orthogonal Expansion for D Transformation of Combined Code and Its Applications"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 1, Jan 79 pp 4-24

TEXT OF ENGLISH ABSTRACT: It is proved that 2^n functional vectors DX_{mi} (m = 0, 1, 2, ..., n; i = 1, 2, ..., C_n^m), belonging to the D transformation set $\{DF_N\}$ of the vector space $\{F_n\}$ of N-ary logical functions, constitute a complete set of orthogonal bases for $\{DF_n\}$. Some properties of $\{f(s)\}$ that is the projection of $\{DF_n\}$ onto these orthogonal bases are examined, and the problem of orthogonal expansion of $D(F_n \oplus CL)$, the D transformation of $(F_n \oplus CL)$, which is the digital modulation of a sequence CL_μ with μ times clock freqeuency by F_n, was studied as well. Two approaches to obtain $\{f(s)\}$ have been given in this paper.

As one application of the orthogonal expansion of D transformation, much attention also has been given to the derivation of normalized autocorrelation functions and normalized power spectral density functions of DF_n and $D(F_n \quad CL)$,

[Continuation of DIANZI XUEBAO No 1, Jan 79 pp 4-24]

where F_n is a combined code with n PN codes being prime each other in period and CL is the code clock. By using the expression derived in this paper, extremely simple arithmetic operations are sufficient to obtain the above mentioned two types of functions of particular PN combined codes f (s). It's possible to realize any complicated logical operation by means of the ALU in a general-purpose computer when this method of orthogonal expansion with D transformation is applied.

Thanks are due colleagues Qian Wuhuang [6929 3019 3435], He Mingxi [0149 2494 3305], Liu Zhongquan [0491 0112 2938], and Feng Shichang [7458 0013 1603] for providing valuable counsel and assistances. Received in April 1978.

[Continuation of DIANZI XUEBAO No 1, Jan 79 pp 37-[illegible]7

Taking the I^2L LSI or VLSI as a single device, we can specify and measure the static input and output characteristics. It exhibits various regions of operation.

For each of these various modes of operation, we can simplify the analysis, and obtain, with appropriate approximation, simple equivalent circuits, which can be used for CAD.

The Eber-Moll and Grummel-Poon models are useful for junction transistors. However, these models are insufficient for three mutually interactive junctions. Especially for the dynamic behavior of I L, it is necessary to consider the building up of or decaying of the "Total Number of Excess Carriers" in the entire I^2L. The charging and discharging are no more constants as that has been assumed in the "Charge control" theory. Simplified equations will be given for the dynamic analysis of I^2L. This analysis provides useful basic principles for the device design theory and the circuit design theory.

Received in August 1978.

AUTHORS: LIN Zaixu[2651 0961 2485]

ORG: None

TITLE: "A New Method of Cascade Synthesis for Lossless 4-Poles Network"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 1, Jan 79 pp 51-63

TEXT OF ENGLISH ABSTRACT: This paper presents two steps for synthesis when transfer zeros are complexes, the first step--a ladder network with negative elements is formed by expansion in a method generalized from Brune's, the second step--an equivalent network without negative element is derived. The theorem has been proved. Three kinds of equivalent sub-network are given: three-element network, a network without magnetic coupling and Darlington D type network. A series of problems associated with synthesis have been discussed. An example is given for this new method.

Received in May 1978.

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[illegible] [illegible] No 1, Jan 79 pp [illegible]

On [illegible], based on above analyses, two possible applications are presented. In one, the logarithm of signal amplitude is implemented digitally on the principle of ADC. In the other, a proposition, with which a logarithmic amplifier is employed for open-loop gain control, is given.

Received in April 1978.

[illegible]. [illegible] Engn [illegible]

[illegible]. [illegible]

[illegible]. "[illegible] Emitter Transistor (PPI)

[illegible]. [illegible] [illegible] [illegible] in Chinese No 1, Jan 79 pp 77-82

TEXT OF ENGLISH ABSTRACT. The non-crystalline state silicon is used as emitter material for bipolar microwave power transistor. By means of the [illegible] effect of the vertical resistor of this non-crystalline Si layer, injure current crowding at emitter edge can be overcome. The ratio of effectual emitter [illegible] area of a PPI to 1-2 times greater than a usual transistor and the output power-impedance product to 5-10 times greater.

The emitter-base junction capacitance of the PPI is only decided by it's emitter doping profile, so that both smaller base resistance r_b and higher emitter cut-off frequency f_{eb} can simultaneously be obtained. The value of f_{max} is 3-5 times greater than the usual transistor.

Received in August 1978.

AUTHORS: FANG Yongcai [2455 3057 4868]
QU Yanghao [1770 3051 6189]
JIANG Zunfu [1203 6490 1381]
LU Guoming [4151 0948 6900]

ORG: None

TITLE: "Machine Invention"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 1, Jan 79 pp 73-76

TEXT OF ENGLISH ABSTRACT: The concept of mechanical invention is introduced and its realizability is discussed. It is shown that the framework analysis program can be used as the basis of an algorithm program in mechanical invention.

Thanks are due Teacher Qu Chuanlun [3255 1557 3796] of Beijing Aeronautical Engineering College for providing valuable counsel.

AUTHOR: MAO Yuhai [3403 0060 3189]

ORG: None

TITLE: "Linear Transforms Implemented by Transversal Filters"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 1, Jan 79 pp 85-94

Text of English Abstract: In many signal processing applications the original signals are usually transformed to some other forms which are more appropriate for processing or are otherwise more desirable. Most of them are linear transforms, such as convolution and matched filtering. A transversal filter has the capability of highly parallel operation, as it can perform a large amount of weighted sum operations simultaneously. Therefore, it is especially suitable to perform various linear transforms. Particularly, the transversal filters, implemented by CCD and SAW devices in sample analog and analog forms, have higher speed of transform, higher packing density and lower power consumption. This paper summarizes the various linear transforms which can be implemented by transversal filters, including chirp-z transform, sliding chirp-z transform, prime transform, discrete cosine transform, discrete cosine prime transform and two dimensional chirp-z transform. This paper also makes some predictions about possible trends in this field in the near future.

Received in May 1978.

AUTHORS: GAO Qingshi [7559 1987 3740]
ZHANG Xiang [1728 4382]

ORG: None

TITLE: "On the Cellular Vector Computer of Vertical and Horizontal Processing"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 2, Feb 79 pp 1-7

TEXT OF ENGLISH ABSTRACT: With the rapid development of the semiconductor integrated circuit technology, the cellular computer becomes an important trend for giant computers. There is no doubt that multiprocessor systems, array processor systems and associative array processor systems may be cellulated. But what will be with the more preferable giant vector computers for which the language may be expanded on the basis of the standard languages, the operating rules are similar to the conventional rules, and the efficiency is higher? Can they be cellulated? This is what the present article will discuss in detail and the answer is positive. In this paper, some vector expansion of the standard language and an architecture of the vector computer of vertical and horizontal processing are described.

[Continuation of DIANZI XUEBAO No 2, Feb 79 pp 1-17]

Furthermore, the architecture of the normal cellular vector computer, and the architecture of cellular vector computer of vertical and horizontal processing are discussed.

Finally, the advantages and the limitations due to which the number of cell-elements of vector computers can't be very large are described.

Thanks are due colleague Wang Jiamo [3769 0857 6206] for taking part in research.

AUTHORS: ZHANG Rirong [4545 2480 2837]
LI Fengshi, et al [2621 7685 5347]

ORG: High Efficiency Feeds Group

TITLE: "Complex Multi-Mode Horn"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 2, Feb 79 pp 9-23

TEXT OF ENGLISH ABSTRACT: Corrugated wall horns and smooth wall multimode horns are two compartively ideal feeds with high efficiency. Further study on mode conversion between the two types of horns is presented. The concept of combining hybrid mode technology for corrugated wall with multimode technology for smooth wall in one horn is suggested. An engineering design method for using it to control the characteristics of different frequency zones respectively is depicted. The complex multimode horn which is of small size, good performance and easy to manufacture is successfully developed. The antenna efficiency may be increased up to 70 percent with the improved version of double-mirror antenna feed for the 4/6GHz band (except a few frequencies). The possibility to develop high efficient new feeds by making combined use of various hybrid mode and smooth wall multimode technologies is demonstrated.

[Continuation of DIANZI XUEBAO No 2, Feb 79 pp 9-23]

Thanks are due Qiu Yuanheng [6726 3293 0077] of First Research Institute, Ministry of Posts and Telecommunications, for computing work. Received in April 1978.

AUTHORS: WU Hongshi [0702 7703 6684]
WANG Zhihua [3769 4160 5478]

ORG: None

TITLE: "A Study on Helix-Coupled Type Slow Wave Structures"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 2, Feb 79 pp 24-42

TEXT OF ENGLISH ABSTRACT: The helix coupled vane and helix coupled bar circuits belong to a new type of slow wave structures for highpower crossed-field amplifiers. These circuits are characterized by their very wide bandwidth, relatively high coupling impedance as well as high average power-handling capability, and hence obtain wide applications. Both multi-conductor transmission line method and equivalent circuit method are used to carry out theoretical analysis of these SWSs. Analytical expressions for dispersion characteristic, coupling impedance and transverse field distribution are derived; the effects of each dimensional variation on dispersion characteristics and coupling impedance are given on the basis of a large quantity of computer results. A comparison between computed and experimental values indicates that results given in this paper are sufficient for engineering design purpose.

Received in April 1978.

AUTHORS: WANG Shoujue [3769 1343 6030]
SUN Xiangyi [1327 4382 5030]
WANG Runmei [3769 3387 2734]

ORG: None

TITLE: "A New High Speed Integrated Logic--Multicell-type Logic (DYL)"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 2, Feb 79 pp 43-51

TEXT OF ENGLISH ABSTRACT: A new high speed integrated logic has been described. Instead of a single type of cell gate which is used in most logic IC's, the new logic here described is based on several types of basic cells to synthesize a logic system. Therefore, the threshold characteristics will not be the common requirement for each type of cell gates. The main logic unit in DYL is a very high-speed linear AND-OR gate made with simple technology (without threshold). A four-bit full adder carry chain specimen has been developed with wide-line photolithography. It's time-delay measured for each carry stage is about 1 ns for the front edge of the signal and even much smaller for the trailing edge. The maximum power dissipation per gate is about 12.5 mW. This new logic has been analysed and compared with several conventional integrated logic circuits.

[Continuation of DIANZI XUEBAO No 2, Feb 79 pp 43-51]

Thanks are due Fu Shugui [0102 3219 2710], Yang Liulin [2799 2692 2651], Wei Shuming [7614 2579 6900], Wang Xianggui [3769 4382 6311], Liu Panquan [0491 4149 3123], and Jiang Aihua [1203 1947 5478] for assistances. Received in May 1978.

AUTHOR: GAO Guangbo [7559 0342 3258]

ORG: None

TITLE: "Nonuniform Distribution of Junction Temperature and Current in Bipolar Microwave Power Transistors"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 2, Feb 79 pp 52-62

TEXT OF ENGLISH ABSTRACT: The three-dimensional heat conduction equation for steady state operating conditions of bi-polar microwave power transistors has been solved.

Based on the principle of thermal-electric feedback, the nonuniform distribution of current and junction temperature in bipolar microwave power transistors have been calculated, the effects of the collector bias voltage and emitter ballast resistors on this distributions have been discussed quantitively, and a ballast technique of the unequal values of the resistors has been presented.

The experiments have shown that the use of this technique in microwave power transistors has given rise to a considerable improvement in uniform distribution of junction temperature and current.

Received in April 1978.

AUTHORS: GU Huaijin [7357 2037 3866]
NI Rongsheng [0242 2837 3932]

ORG: None

TITLE: "Optimum Demodulation of Time-Varying Parameters of Signals in the Presence of Noise"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 2, Feb 79 pp 63-76

TEXT OF ENGLISH ABSTRACT: The non-linear estimation of time-varying parameters of signals in the presence of noise is discussed. A concept of instantaneous maximum likelihood estimation is presented and is shown to be asymptotically sufficient. A new approach of optimum estimation has been found by which the difficult problem of non-linear estimation of time-varying parameters of signals is simplified as first finding the instantaneous maximum likelihood estimation and then its optimum processing.

The apparatus used to realize the instantaneous maximum likelihood estimation is defined as optimum demodulator and its general configuration is given. The application of the above theory is described with the phase-modulated signal used as an example. Finally, the results obtained in this paper are compared with those of D. C. Youla and D. L. Snyder.

Received in March 1978.

AUTHOR: GAO Shunquan [7559 7311 3123]

ORG: None

TITLE: "Design of Lossy Filters With Minimum Flat Attentuation"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 2, Feb 79 pp 77-92

TEXT OF ENGLISH ABSTRACT: A general equation revealing the relationship between the attentuation at passband center A (0) and the parasitic dissipation factor of the elements a and input dissipation factor d is derived for all-pole type lossy filter. Based upon this equation, families of curves are computed and plotted for three conventional types of filters. For filters with given element dissipation factor, both the optimum selection of the input dissipation factor and the determination of the attenuation at the passband center can be readily accomplished with the aid of these curves. If the allowable range of the attenuation at the passband center is given, the same families of curves enable us to determine conveniently the corresponding allowable range of the element dissipation factor.

Some problems of practical interest are also discussed in connection with examples.

Received in April 1978.

AUTHORS: GU Zhiyu [7357 0037 3768]
ZHAO Zhonghong [6392 0112 1347]
ZHAI Baoguang [5049 1405 0342]
WU Chengmao [0702 2110 2021]

ORG: None

TITLE: "Experimental Research of the XeF Exciplex Laser Pumped by Electron-Beam"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 2, Feb 79 pp 93-100

TEXT OF ENGLISH ABSTRACT: An ultraviolet XeF exciplex laser pumped by electron-beam is described. A high density rectangular electron beam is obtained easily by using a long razor-shape cathode and the active material is successfully pumped by this type of beam.

Thanks are due Huang Xinyi [7806 0207 0001], Xia Nengqiao [1115 5174 2884], Zhou Zhou Houlin [0719 0624 3829], and Ge Ji [5514 7221] for assistances. Received in June 1978.

10424
CSO: 4009

AUTHOR: LU Wenzhao [7120 2429 6856]

ORG: None

TITLE: "The Problem of Extending the Function Defined on a C^m- Manifold"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY] in Chinese No 2, 1979 pp 1-4 & 16

TEXT OF ENGLISH ABSTRACT: In this paper we give the theorems for extending the C^m-function defined on a subset of a differential manifold to a C^m-function defined on all of the manifold and with some applications of them.

AUTHORS: JIN Zhiquan [6855 1807 2938]
CHEN Peipei [7115 3805 3805]

ORG: None

TITLE: "A Note on Recreating Source Code From Reverse Polish Form"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY] in Chinese No 2, 1979 pp 5-16

TEXT OF ENGLISH ABSTRACT: This note gives a survey of the algorithms which recreate infix forms of general arithmetic expressions from their corresponding reverse Polish Forms. As a result of improving the bracket processing method presented by P. J. Brown this method is not only more reliable, but also more intuitive. Furthermore, the method used here may be applied to the cases of n dimensional indexed variables and functions of n arguments.

AUTHORS: LI Zongyun [2621 1350 0061]
DAI Wensai [2071 2429 6357] [since deceased]

ORG: None

TITLE: "Analysis of Color Indices and Mass-Luminosities Ratios of Galaxies"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY] in Chinese No 2, 1979 pp 17-22

TEXT OF ENGLISH ABSTRACT: We analysed $(B-V)_T^o$ values of 908 galaxies, $(U-B)_T^o$ values of 541 galaxies and mass-luminosity ratios of 174 galaxies. Both color indices decrease along the Hubble sequence, but dispersion of color is very large. Averaged according to morphological type, $(B-V)_T^o$ ranges from 0.87 for E galaxies to 0.35 for I_m galaxies; $(U-B)_T^o$ ranges from 0.43 for E galaxies to -0.33 for I_m galaxies. 541 galaxy formed an obvious sequence along a diagonal of the two color diagram $(B-V)_T^o - (U-B)_T^o$. This can be explained by the different mixture of stellar population, which made up the galaxies.

No definite relation was found between mass-luminosity ratios and morphological type. For various types of the spirals and the magellanic irregulars, the average values range from 8.5 to 12.5, for the elliptical galaxies it is 21.6.

[Continuation of NANJING DAXUE XUEBAO No 2, 1979 pp 17-22]

The dispersion of color of irregular galaxies of type 10 is particularly large, the average of $(B-V)_T^o$ being 0.61, that of $(U-B)_T^o$ being 0.10, for three such galaxies of known mass, the average M/L ratio is 3.9, which is particularly small.

The analysis of the color indices and the mass-luminosity ratios provided useful data for further investigation of the cosmogonical significance of the Hubble classification.

AUTHORS: HUANG Jiehao [7806 0094 3185]
HUANG Keliang [7806 0344 6156]
PENG Qiuhe [1756 4428 0735]

ORG: None

TITLE: "The Spiral Structure of Galaxies Is Three-Dimension"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY] in Chinese No 2, 1979 pp 23-30

TEXT OF ENGLISH ABSTRACT: In this paper we discuss the spiral structure of dish galaxies in three-dimension according to the density wave theory. Since the spiral pattern is related to z, the observed spiral arms of external galaxies whose masses are equal to 1.5, 1, 0.2 times the mass of our own galaxy, respectively. The results have shown that the more massive the galactic mass is, the narrower the spiral arm will be. That is coincident with the observed results, qualitatively.

Thanks are due Professors Lin Jiaqiao [2651 1367 5062] and Dai Wensai [2071 2429 6357] for discussions.

AUTHORS: XU Zheniao [1776 2182 7290]
JIANG Yaotiao [5592 4507 4511]

ORG: None

TITLE: "The Solar Activity of the 17th Century Viewed in the Light of the Sunspot Records in the Local Topographies of China"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY] in Chinese No 2, 1979 pp 31-38

TEXT OF ENGLISH ABSTRACT: New 21 naked-eye sunspot records in the 17th century were found and investigated in a lot of local topographies of China. These data are not known until now. By comparison with the European telescopic sunspot records at the same time we have discussed in detail the solar activity of the 17th century. We have checked the Wolf's extreme times and given new reasonable values. Besides, we have commented the Maunder Minimum and concluded that it is incorrect inference for lack of sufficient sunspot records.

Thanks are due colleague Li Tiansi [2621 1131 6337] for verifying historical sunspot data.

AUTHOR: SHUI Yongan [3055 3057 1344]

ORG: None

TITLE: "Interelectrode Multi-reflections of the Interdigital Array"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY] in Chinese No 2, 1979 pp 39-48

TEXT OF ENGLISH ABSTRACT: In order to calculate the effect of the interelectrode multireflections of the interdigital array, it is usually proceeded by a series complicated matrix multiplications by assuming a given imepedance discontinuity. Here we introduce two parameters, which have obvious physical significance, so that an analytical expression for the effect of interelectrode multireflections is obt ned, which can be used to make convenient analysis of relations between the parameters and characteristics of the interdigital array. In addition, the reflection characteristics of reflective gratings, the frequency responses of interdigital transducers and the coupling generation curves of interdigital transducers are discussed.

AUTHORS: TANG Wenxia [0781 7186 7209]
GUAN Yintong [4619 5593 2717]

ORG: None

TITLE: "Anti-Tumor Activity and Mechanism of Action of Platinum Complexes"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY] in Chinese No 2, 1979 pp 49-64 and 144

TEXT OF ENGLISH ABSTRACT: The extensive studies carried out by bioinorganists biochemists and biophysicists hae led to the conclusion that antitumor activity of platinum complexes is related to their chemical structure and platinum antitumor compounds exert their potency by inhibiting the replication of DNA and preventing cell division. But the exact structure-activity relationship and the nature of binding between DNA and platinum complex are not yet understood.

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[illegible]

[illegible]

Body small, elongated, 1.61–1.81 × 0.31–0.41 mm. Cuticle covered with small spines in front of the posterior annulation. Head color reddish, 0.131–0.143 mm in width, armed with 10 head spines, arranged in a row of spines. Oral cavity tubiform-oval, 0.051–0.061 × 0.051–0.061 mm. Annulation larger, located at anterior third of body, 0.163–0.171 × 0.163–0.171 mm; prepharynx present. Pharynx oval, 0.071–0.081 × 0.071 mm. Oesophagus 0.163–0.171 mm in long. Cervi according to posteriority end of the body. Ventral tendon, ovoid, associated with each other, in middle third of body, anterior tendon oval, 0.[illegible] × 0.[illegible] mm., posterior one oval or triangular, 0.[illegible] × 0.[illegible] mm. Tissue not developed, 0.[illegible] × 0.[illegible] mm. Uterus oval, over or others covered by the posterior margin of annulation, 0.[illegible] × 0.[illegible] mm. Vestibule convoluted, in a level of the anterior margin of annulation reaches to the posterior end of body and ventral ventricle behind the posterior ovaries. Uterus underdeveloped, containing a bit of eggs, 1–3 in number. Eggs large, 0.[illegible] × 0.[illegible] mm.

The new species closely resembles Dolichostomoides spinosum Gibson, 1971 and Dolichostomoides magni Gibson, 1973, but is set by determined from D. spinosum by 13 rather spines and differ from D. magni by stalkanger size, the ventral

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[illegible] of [illegible] No 2, 1979 pp 81-100]

1. The breccia and pudding stone consist of correspondent angular and cobbelon fragments produced by tectonic fragmentation of pre-existing rock. The term of breccia and pudding stone is used for rocks containing fragments larger than about 1/2 cm, fine gravel for those with fragments from 1 mm to 1/2 cm.

2. Cataclastites are rocks showing a cataclastic texture without schistosity or preferred orientation.

3. Mylonites are rocks showing mylonitic texture with banding structure are are preferred orientation. The banding structure is usually the alternation of different mineral compositions or different degree of granulation.

4. Phyllonites (Phyllite-mylonites) are rocks of phyllitic appearance, and phyllitic structure can be presented on the specimen. It is clear that the phenomena of strong mineral and recrystallization in phyllonites are prevalent than mylonites.

5. Phyllites and schists are subjected to considerable extent of recrystallization, therefore the mineralogical recrystallization takes place in these rocks. The general features that phyllonite-schist are formed by dynamic and regional metamorphism are very similar, both of them have been distinguished only through the methods of investigation on field.

[illegible] of [illegible] No 2, 1979 pp 81-100]

6. Pumiceo (Pseudomylonite, pseudotachylyte) are a specific textures. The glassy rock is produced by melting in high temperature, and it is generally of rare occurrence.

Thanks are due Professors Ye Yaqin [1778 0466 0530], Sun Wei [1327 7850], Chen Lingshi [7115 0109 2516] and Wang Dexi [3769 1795 3120] for revising the draft and providing instructions.

Table 1. Classification and nomenclature of tectonites 1977

[Continuation of NANJING DAXUE XUEBAO No 2, 1979 pp 83-100]

Category	Nature of matrix		Structure	Texture	Gradation of grain(mm) and proportion of matrix (%)			
					0—10%	2—0.5mm 10—30%	0.5—0.02mm 30—90%	<0.02mm 90—100%
Breccia-pudding-stone	cataclastic		non-orientation or orientation	brecciated pudding stony	breccia puddingstone			
Cataclasite			non-orientation	cataclastic mortar powdery	cataclasite	mortar rock	granulitic rock	powdery rock (mud smear of fault)
Mylonite	mylonitic		lenticular banded	mylonitic		granulated rock coarse-mylonite	mylonite	ultramylonite
Phyllonite	mylonitic	10—50 %	parallel	phyllonitic blasto-mylonitic	phyllonite, blasto-mylonite, hornschiefer			
		50—90 %	lamination	blastic-mylonitic gneiss-mylonitic	blastic-mylonite, gneiss-mylonite			
Structural schist		90-100 %	phyllonitic	micaceous-pebbleitic	phyllite			
			schistose	lepidoblastic	schist			
Buchite	glassy		streaky striped	glassy	buchite (hyalomylonite, pseudotakes			

AUTHOR: HUA Ruilin [5478 3843 2651]

ORG: None

TITLE: "Control Extension by Analytical Terrestrial Photogrammetric Methods"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY] in Chinese No 2, 1979 pp 101-117

TEXT OF ENGLISH ABSTRACT: In this paper, two methods for the control extension by analytical terrestrial photogrammetry are described: in the first, the net was made from analytic relationship formulas of image coordinate and its ground coordinate, also the bundle methodwas adopted for adjustment computation, consequentially, orientation element corrections of terrain photographs was obtained as well as the planimetric position and elevation of extension points was determined. In the second, the free scale nets of terrain strip photos were founded upon development formulas in the present paper, finally, orientation and adjustment computation of strip model was performed.

Thanks are due Professor Wang Zhizhuo [3769 0037 0587] and Teacher Cui Biguang [1508 1931 0342] of Wuhan Surveying and Cartography College, Long Hongshang [0397 7701 6345] of Jiangsu Provincial Bureau of Surveying and Cartography, Teacher Jiang Qingyu [3197 1987 7810] of Nanjing Forestry College, and Li Huiguo [0535 1920 0948] of Beijing Geography Institute for revising the draft.

AUTHOR: ZHANG Shifeng [1728 0013 6265]

ORG: None

Title: "The Ultra-Low-Level Jet as Observed by a Tower of 164 m Height at Nanjing"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY] in Chinese No 2, 1979 pp 138-144

TEXT OF ENGLISH ABSTRACT: It is often observed that a low-level wind maximum exists on the vertical wind profile in the atmospheric boundary layer. This phenomenon is also called as boundary layer jet or low-level jet. The low-level jet which appears in the lowest 100-200 meters is to be defined as ultra-low-level jet. Based on one year's continual data gathered by a tower of 164 m. height at Nanjing, some statistical characteristics of the ultra-low-level jet at Nanjing are presented and discussed in this paper.

Thanks are due colleagues Li Huaijin [2621 2037 3866], Wang Yanchang [3769 1750 2490], Yu Zhihao [0151 1807 6275], Lin Yuanbi [2651 0337 1732], and Lu Keli [0712 0344 0448] for assistances, and Ye Pinhua [5509 0756 5478] for drawings.

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CSO: [illegible] END

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